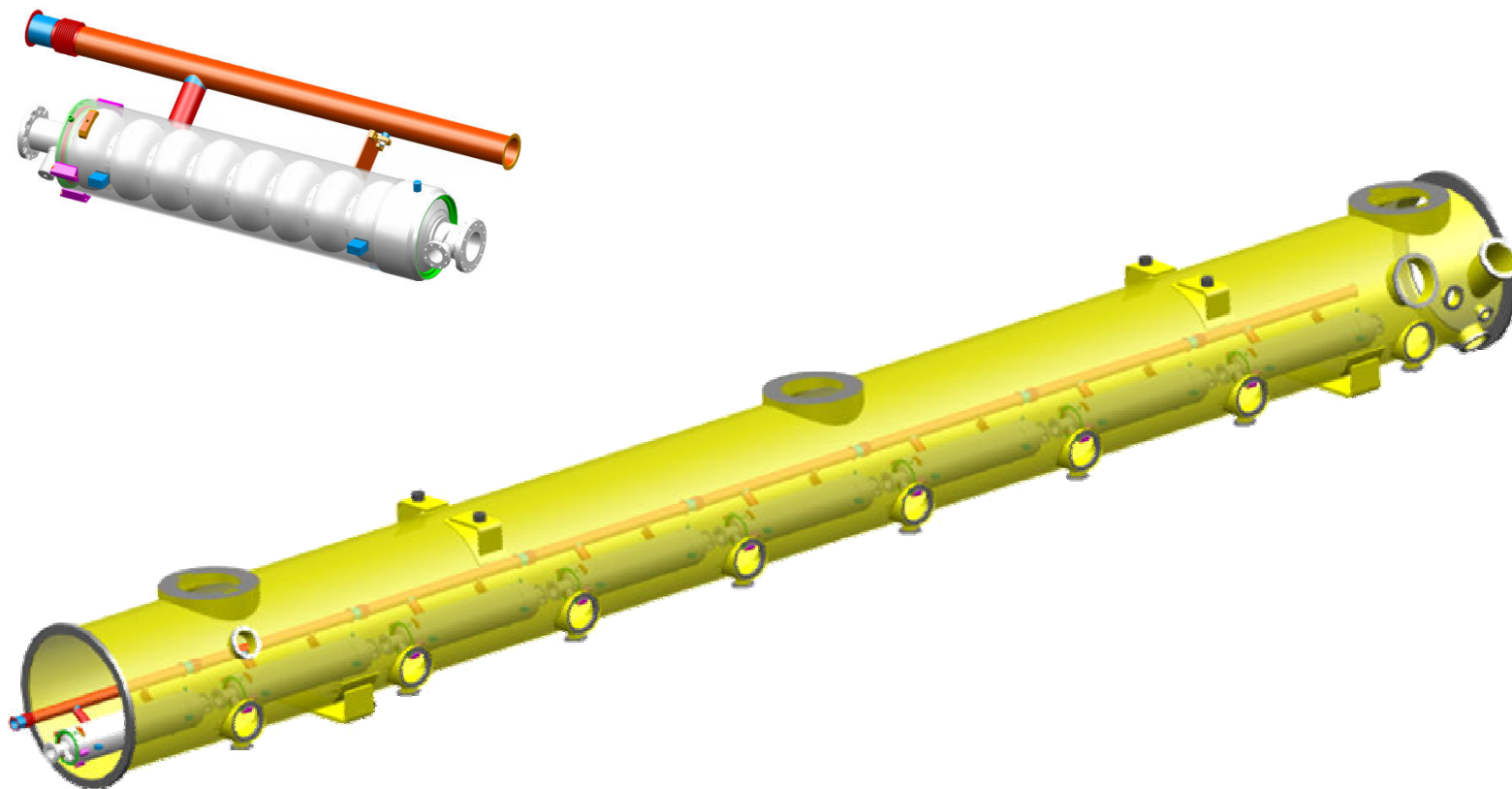


# ILC Cryomodule Fabrication Strategy

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# ILC Cryomodule Fabrication Strategy

## OUTLINE

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- Goals
- Plans to Accomplish Goals
- Current Status of Work
- Overall Fabrication Strategy
- Conclusion

# ILC Cryomodule Fabrication Strategy

## Goals

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- Goals are established and prioritized by FNAL SRFSC
- The primary goal is to fabricate sufficient ILC cryomodules within a given period to populate the SMTF
- Another important goal is the establishment of a substantial R&D effort in cavity fabrication and processing which results a repeatable method of producing cavities which meet the desired accelerating gradient of  $\geq 35\text{MV/m}$
- FY05 goals shown on next slide

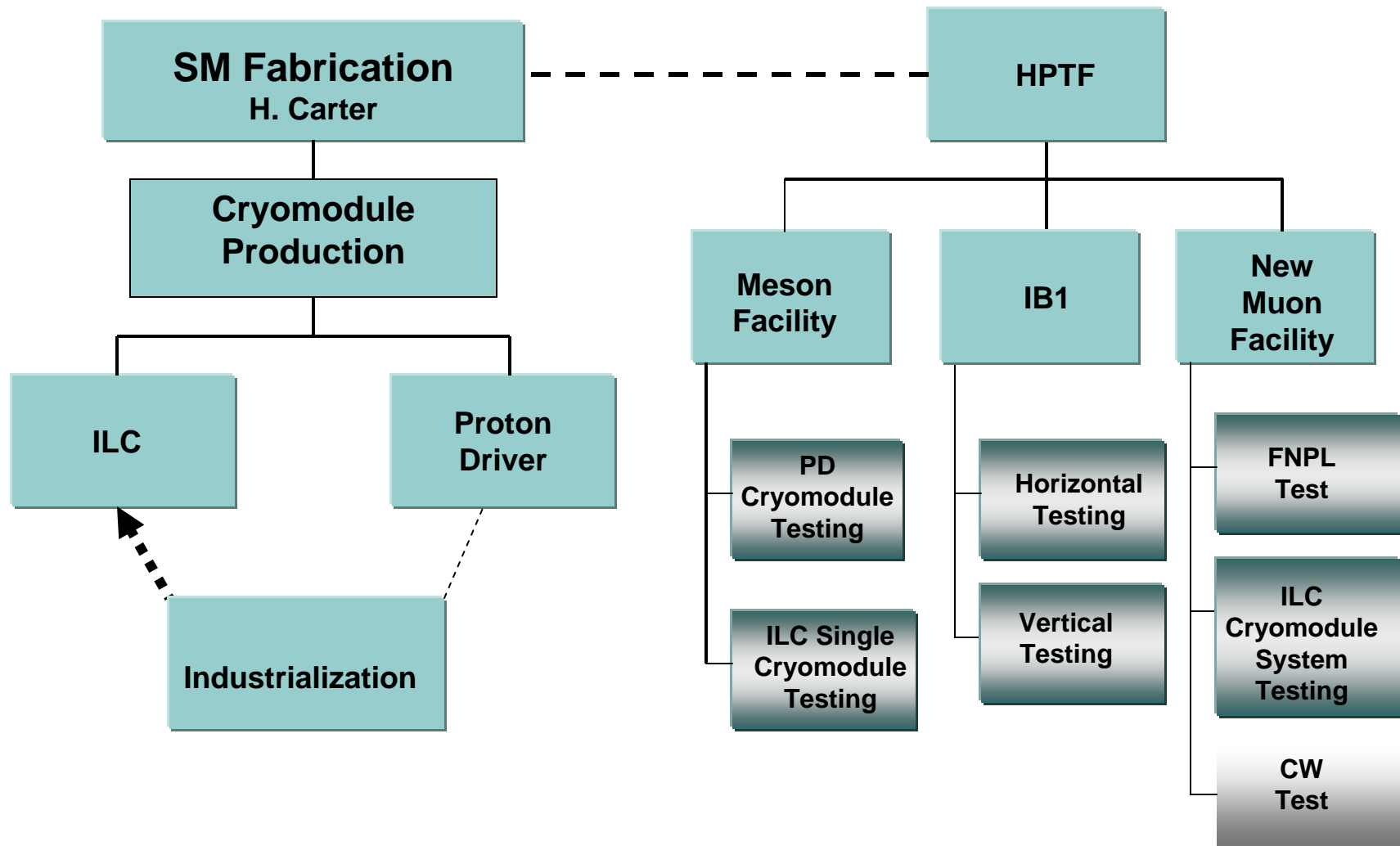
## FY05 Goals Established by the FNAL SRFSC (*in support of ILC & SMTF*)

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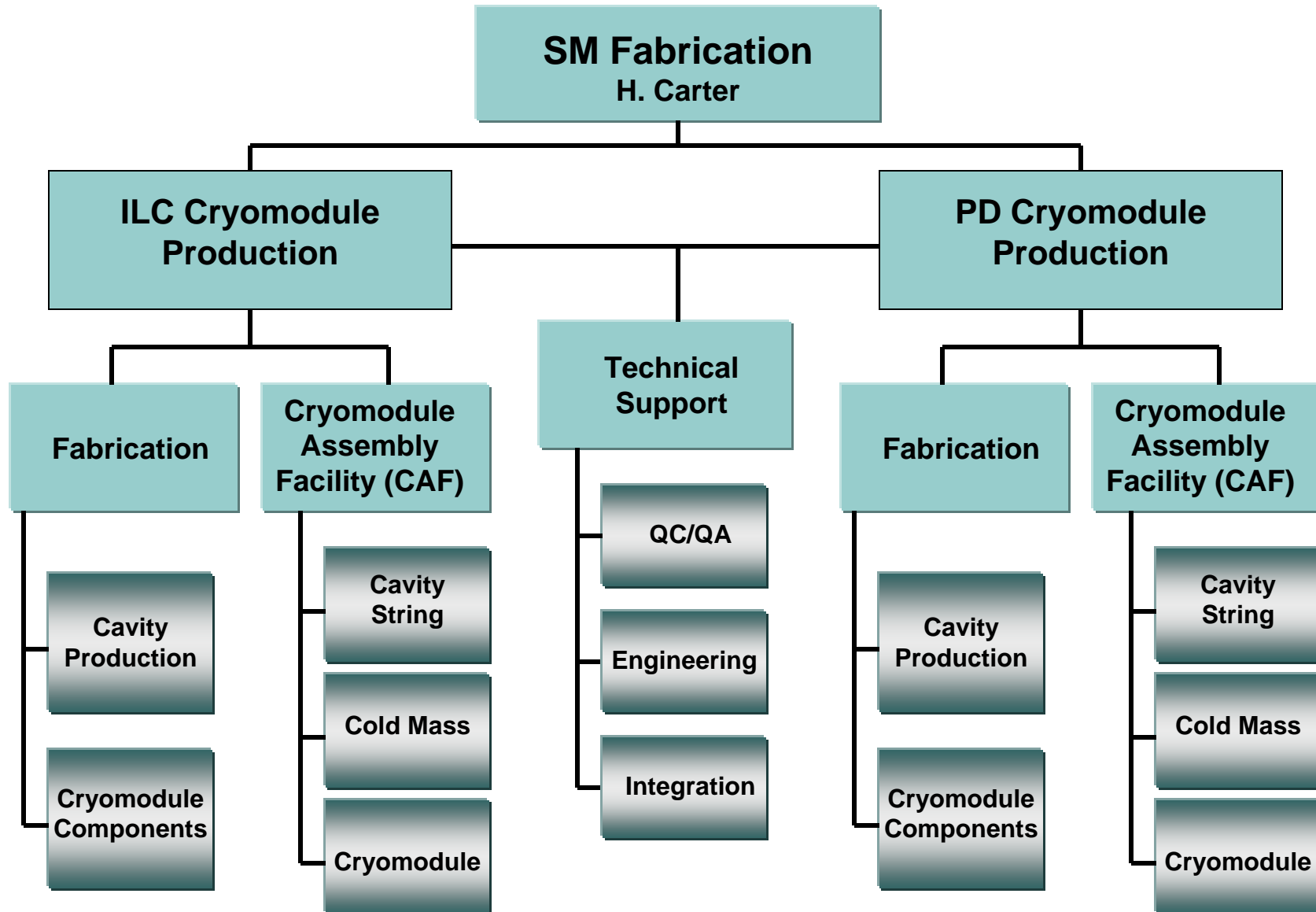
- Design & build Horizontal Test Cryostat (or Chechia vessel)
- Create infrastructure to support 1<sup>st</sup> U.S. built cryomodule construction in CY 06
- Complete joint FNAL/ANL BCP facility
- Begin 1.3 GHz cavity industrialization efforts
- 3.9 GHz Cavities
  - Complete six accelerating cavities (FNAL/JLab effort)
  - Continue deflecting cavity R&D
  - Complete single cavity A0 cryostat(s)
- Complete Capture Cavity #2

## Plans to Accomplish Work

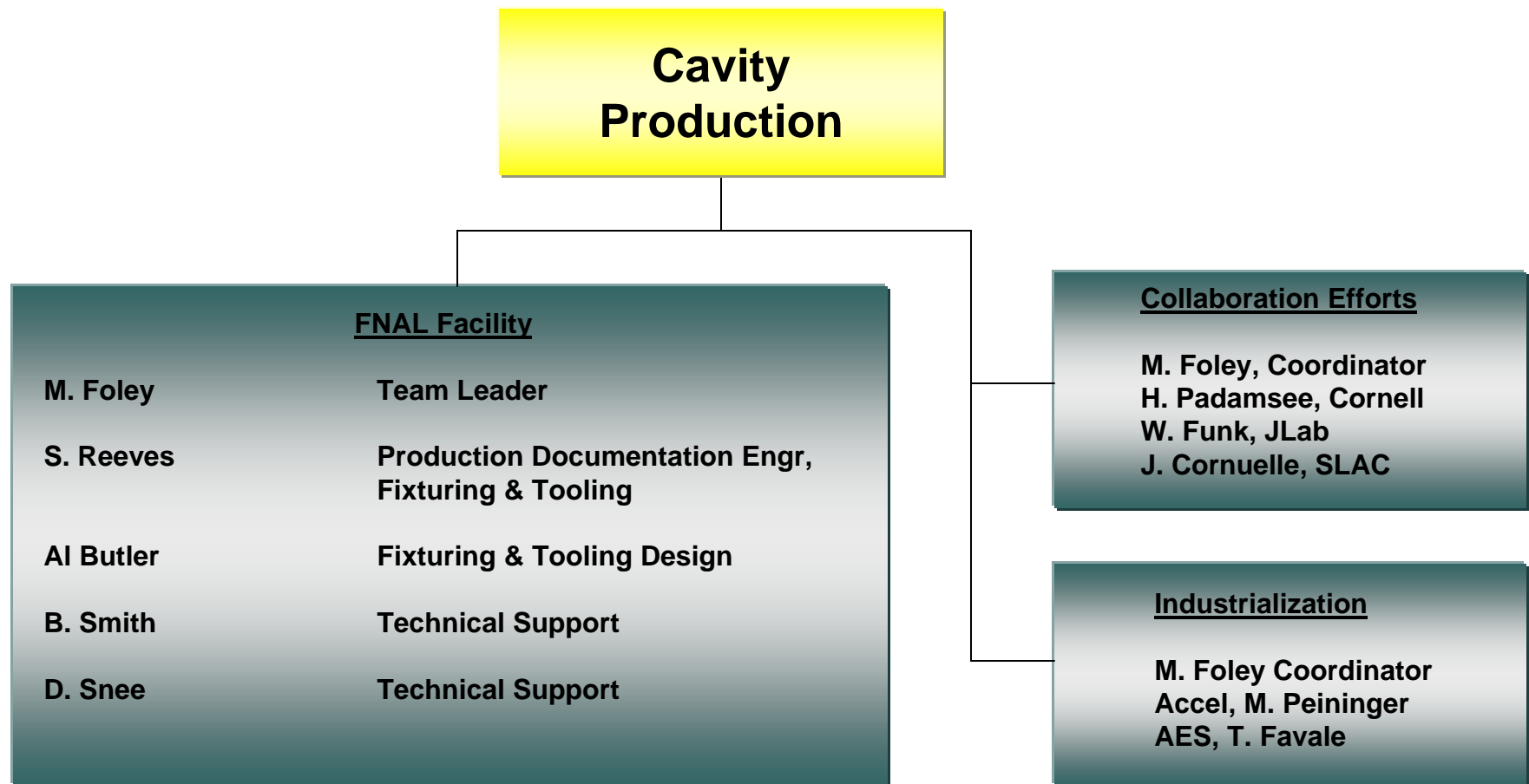
### SM Fabrication and Testing: General Organization



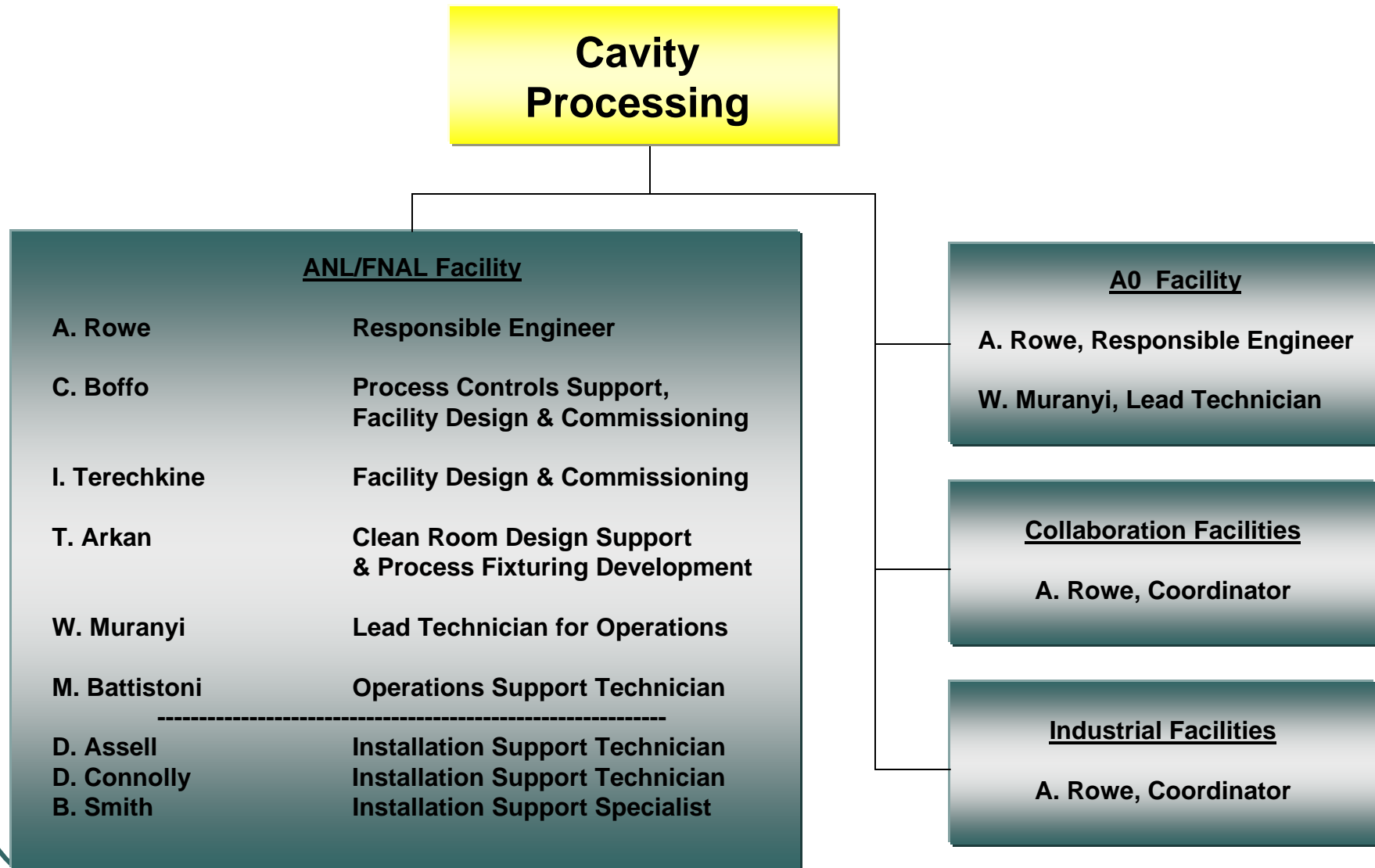
## Plans: SM Fabrication General Organization



# Fabrication: Cavity Production Organization Chart



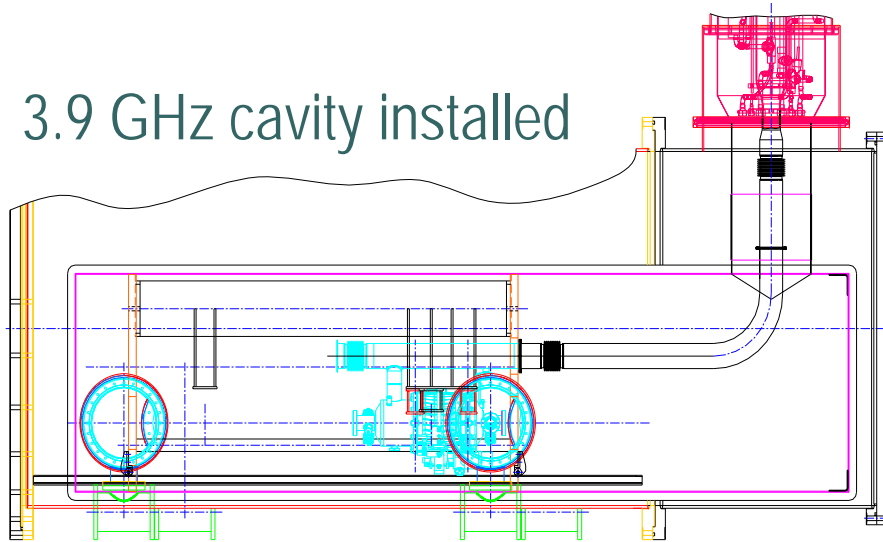
# Cavity Processing Organization Chart



## Horizontal Test Cryostat (Chechia)

- Required for high power testing of single, dressed cavities
- Our design will accommodate both 3.9GHz and 1.3GHz cavity testing

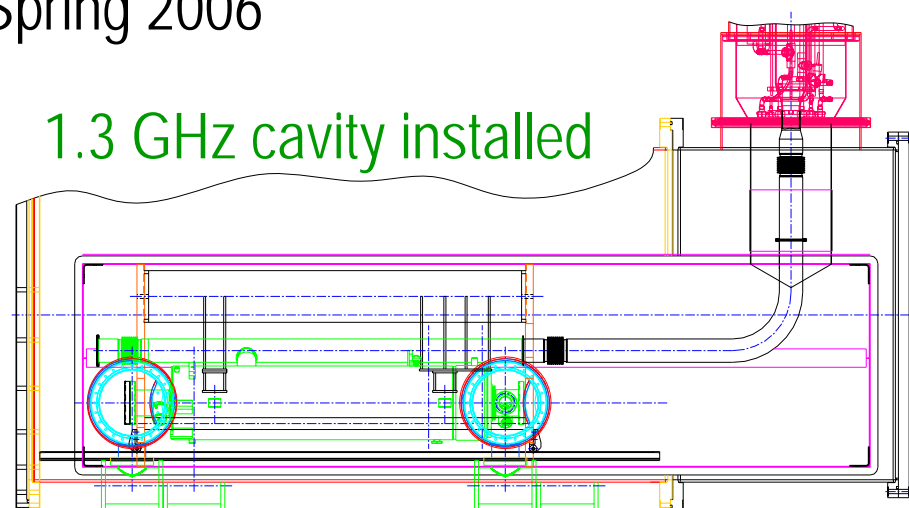
3.9 GHz cavity installed



# Horizontal Test Cryostat, cont.

## 1.3 GHZ Cavity

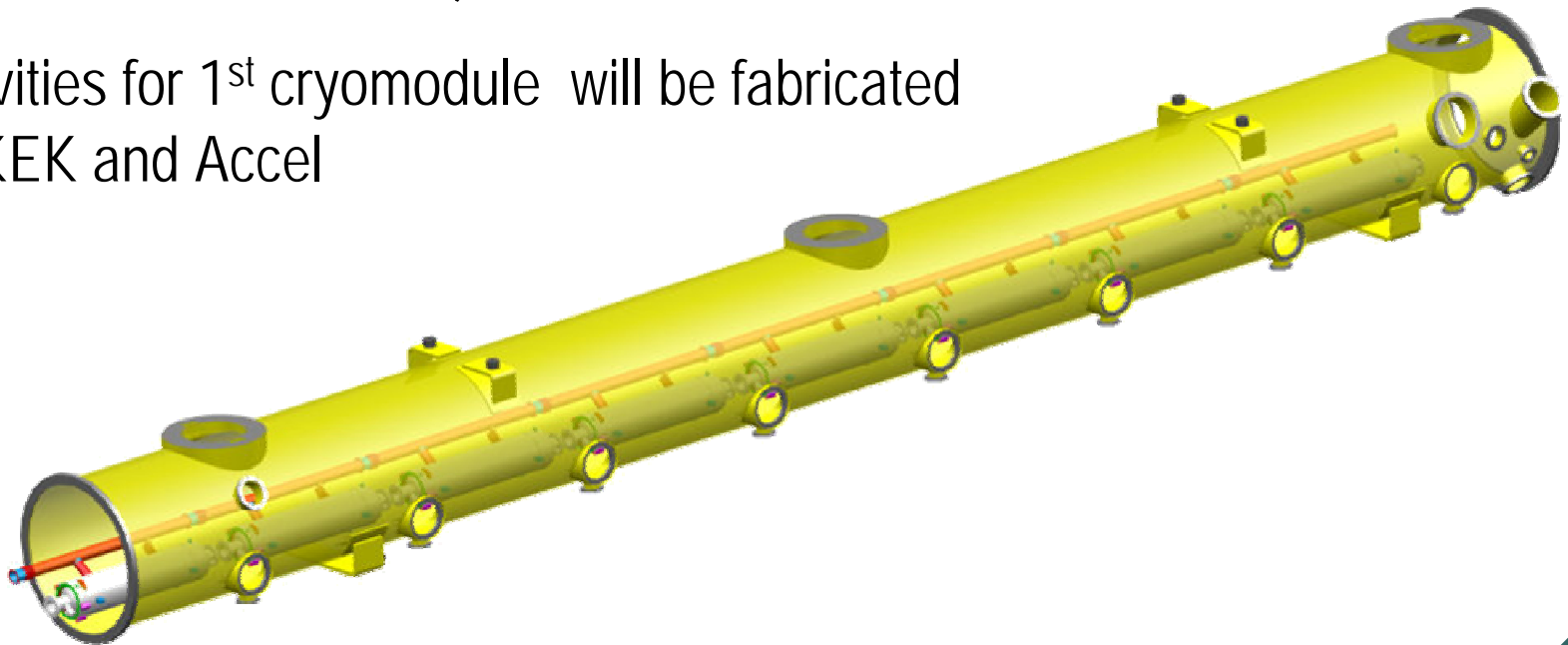
- Design work will be completed in FY05
- Major components will be ordered early in FY06
- Planned to be operational in Spring 2006



# Support Infrastructure for 1<sup>st</sup> U.S. Built Cryomodule

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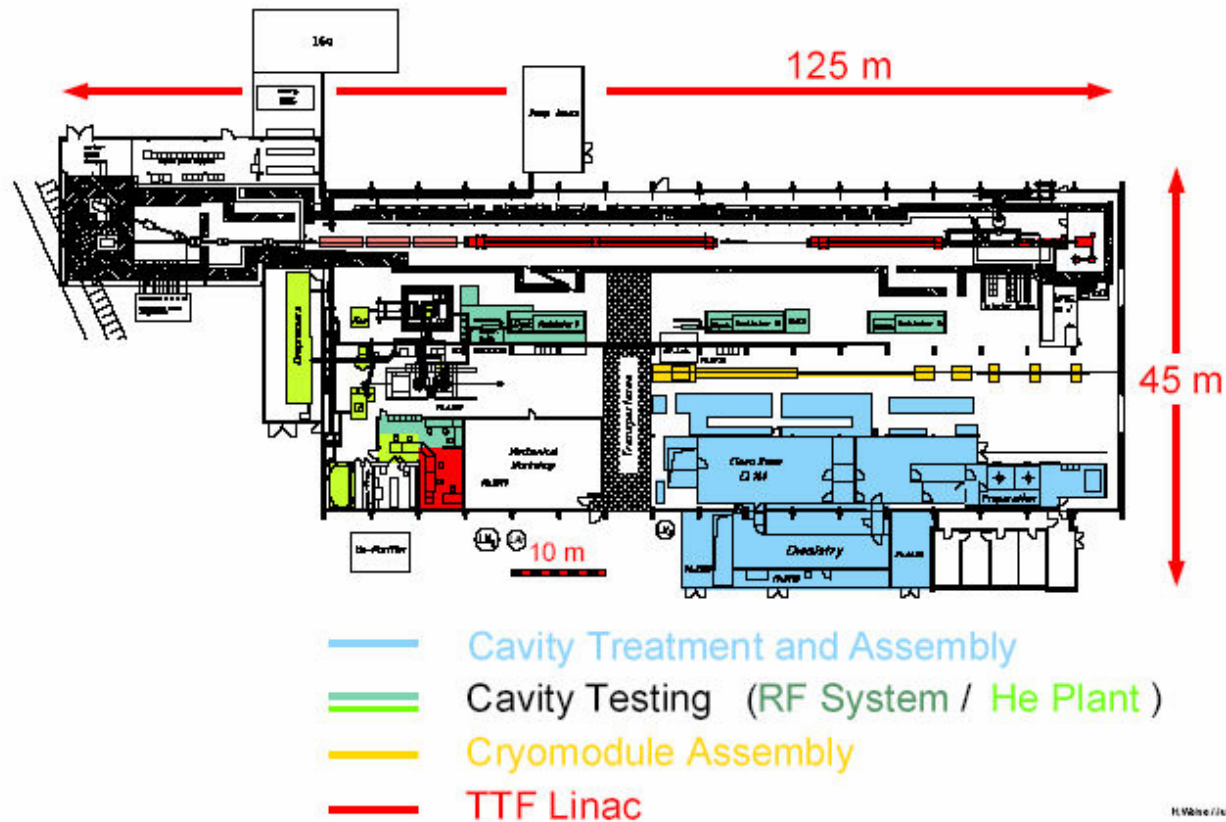
- A 3-D model of the TTF 1.3 GHZ Cryo3 Vessel has been created.
- Preparation of “Americanized” drawings is in progress (consistent with a CY06 deliverable).
- Cavities for 1<sup>st</sup> cryomodule will be fabricated by KEK and Accel



## Support Infrastructure for 1<sup>st</sup> U.S. Built Cryomodule: MP9 Cryomodule Assembly Facility Development

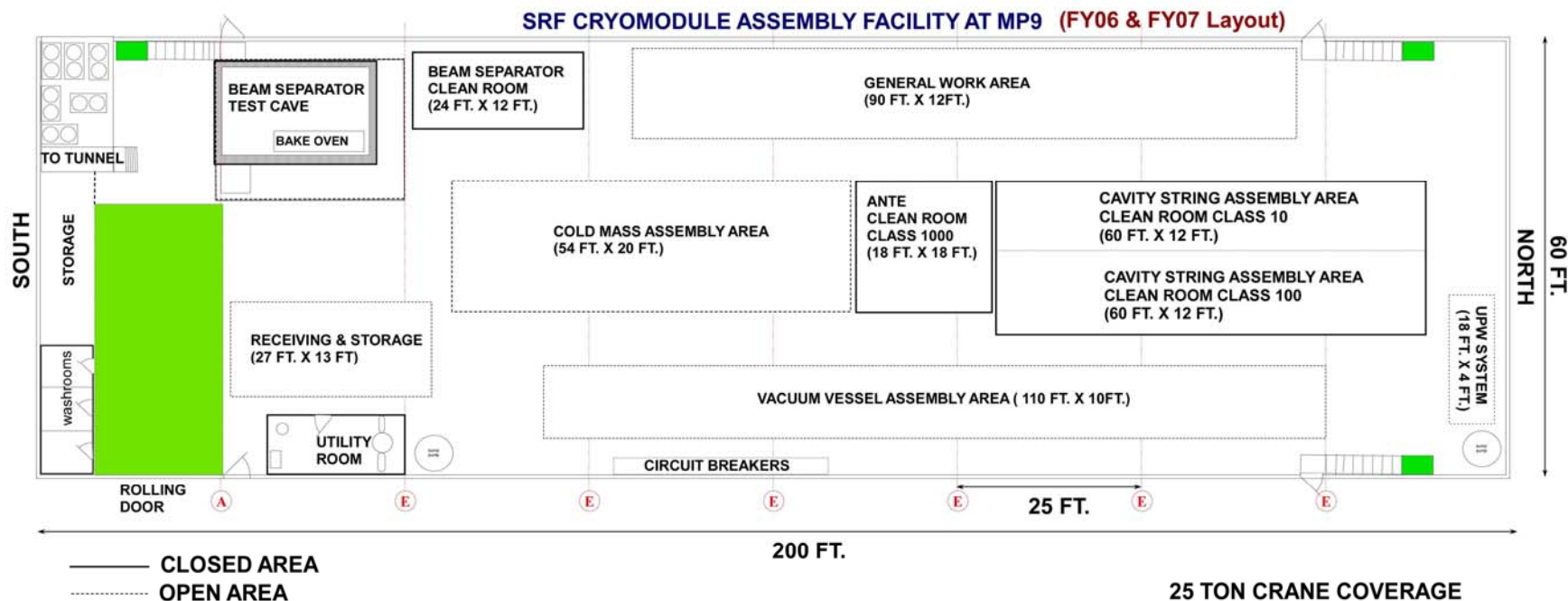
- A facility layout based on DESY's Hall 3 facility (below) is planned

### TESLA TEST FACILITY (HALL 3)



## Support Infrastructure for 1<sup>st</sup> U.S. Built Cryomodule: MP9 Cryomodule Assembly Facility (CAF) Development

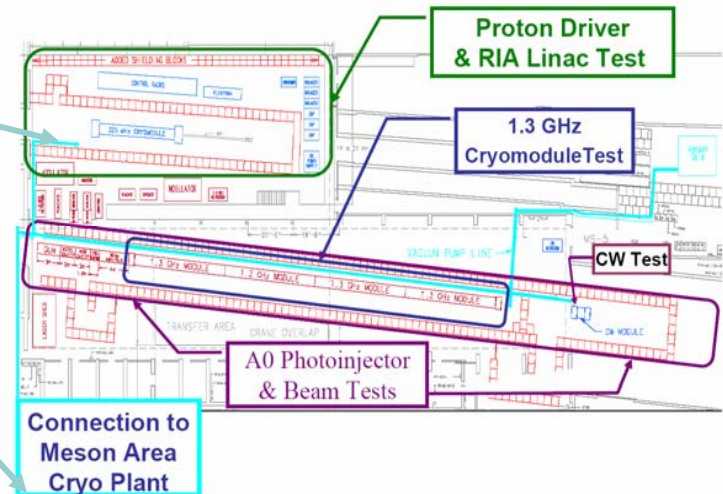
- Tevatron Separator Work at MP9 ends this Fall (~Nov. 2005)
- Building is sufficiently sized for R&D production quantities (1 per month)



# MP9 Cryomodule Assembly Facility Development

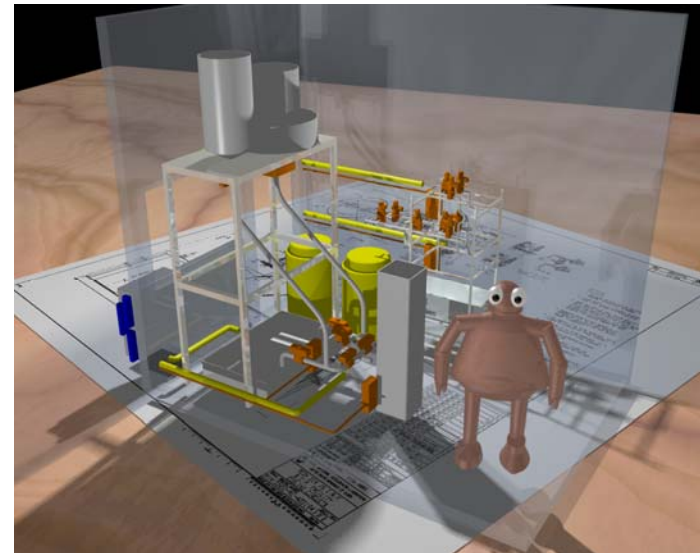


FNAL Meson Area SM&TF Layout Concept



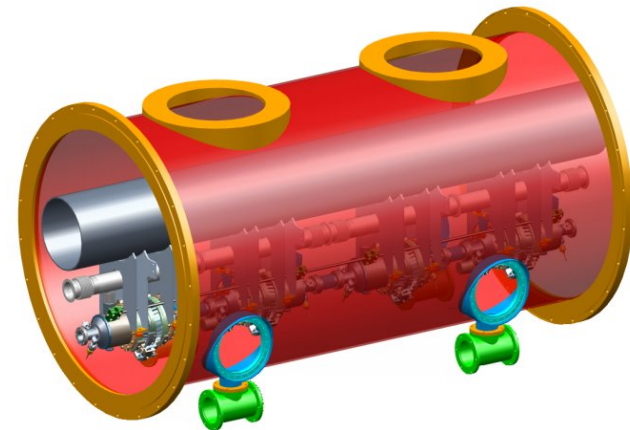
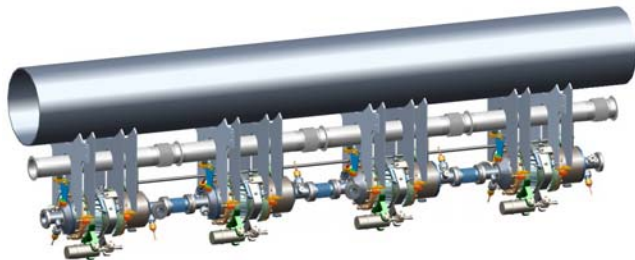
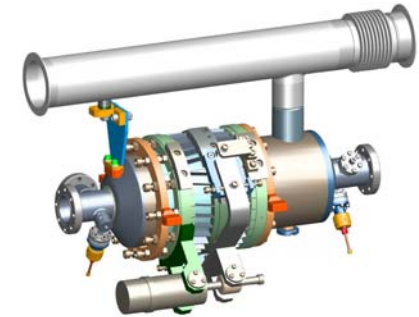
# Joint FNAL/ANL BCP Facility

- Design, construction, and test operation (using water) of FNAL system completed. System now disassembled and ready to be transported to ANL for installation in the newly constructed room inside Building 150.
- FNAL safety review of system completed. A complete ANL safety review will be conducted once the system is installed there.
- Design and construction of 3.9 GHz etching jackets almost complete. 1.3GHz etching jacket design will commence once the 3.9GHz work is complete.
- Infrastructure tooling and fixturing development to support 3.9GHz and 1.3GHz cavity etching underway.
- Facility is scheduled for completion and initial operations by end of CY05

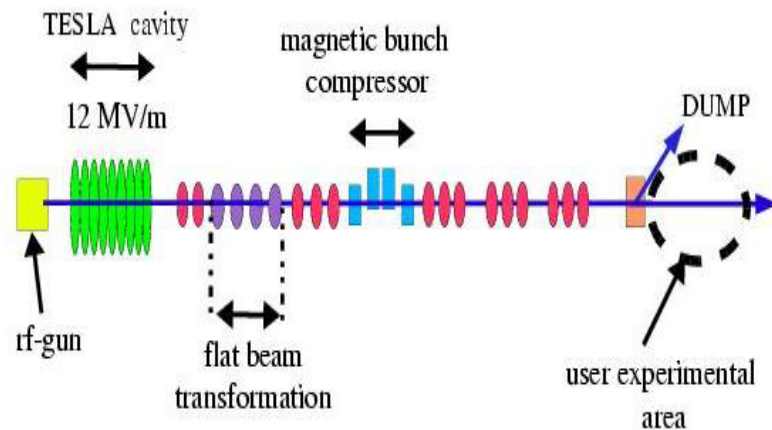


## 3.9 GHz Cavities & Cryostat(s): Work in Progress

- Design coldmass supports, both sliding and fixed
- Design coldmass and cryostat
- Main coupler design
- Helium vessel design complete but may need minor revision
- Helium supply pipe redesign (spacing & material)
- Heat Loads and cool-down analysis

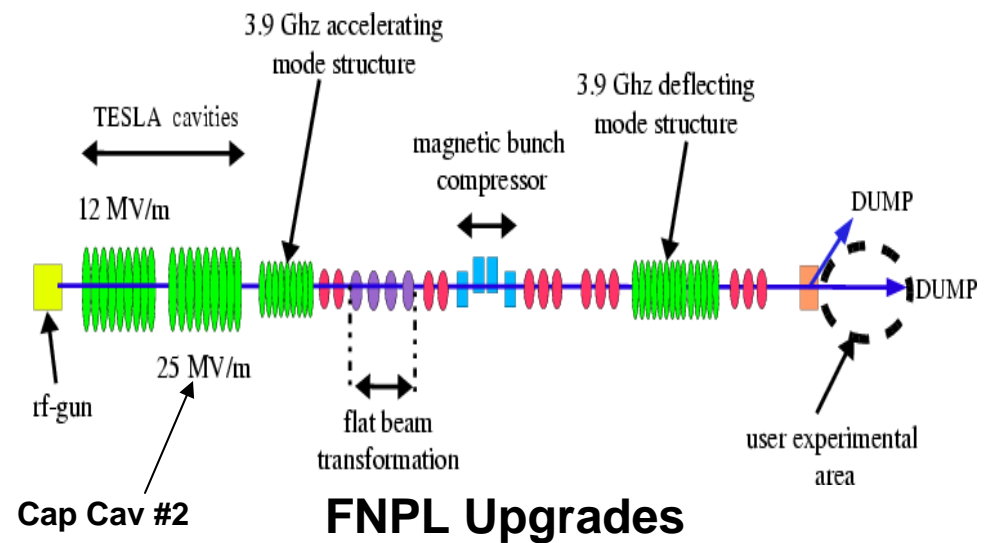


## Capture Cavity #2



### Existing FNPL

- Required for A0 Photoinjector upgrade



### FNPL Upgrades

# Capture Cavity #2 Status

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- Cryostat with poor performing 1.3GHz 9-cell cavity was received from DESY and has been disassembled
- DESY to supply a higher gradient replacement cavity and peripheral components which will be installed when they are received
- Engineering design work well underway
- Scheduled for installation and commissioning at Meson Lab by Sept.-Oct. 2005, and then will undergo a testing program there

# Overall Fabrication Strategy

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- Infrastructure Development:

- Utilize as much existing engineering designs for fixturing, tooling, processes and procedures to establish facilities at Fermilab as quickly as possible
- Utilize existing facilities at

- Cavity Development:

- Utilize available resources for cavities for first cryomodule (KEK, ACCEL, AES, DESY, et. al.)
- Work with laboratories and universities (JLab, SLAC, Cornell, ANL, DESY, etc.) to develop cavity fabrication and processing capability and to develop processes and new techniques

- Coupler Development:

- Utilize available resources for couplers for first cryomodules (CPI)
- Develop new, simpler designs with cost reduction and manufacturability as prime goals

# Overall Fabrication Strategy (Cont.)

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## •Cryomodule Development:

- The first U.S. built cryomodule will be of the TESLA Type III design
- The DESY supplied cryomodule “kit” will be of the TESLA Type III design
- Type IV (ILC Prototype?) cryomodule development will proceed while the first two cryomodules are being assembled

## •Industrialization:

- Identify potential suppliers of cryomodule components and initiate discussions with them
- Conduct informational meetings or workshops with industry
- Establish R&D efforts with interested, “qualified” candidates (\$\$\$\$\$)
- Work with known component vendors to improve manufacturability and reduce costs

# Conclusions

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- We are making very good progress on our FY05 goals
- Infrastructure development to support 1.3GHz cryomodule fabrication is well underway.
- “Deliverables” to the ILC GDE:
  - Development of cavities that repeatably achieve 35MV/m accelerating gradient
  - First U. S. cryomodule will be utilized for development of assembly techniques and infrastructure
  - Development of the next generation (Type IV) ILC Cryomodule
- A strategic approach for cryomodule production and testing that makes use of existing capabilities within the national laboratories and universities has been presented
- Industrialization is only beginning at this time. Initial efforts are with cavity manufacturing companies, both in the United States and in Europe.